Economy and Environment Program
for Southeast Asia
22 Cross Street #02-55
South Bridge Court
Singapore 048421

Phone: (65) 6438 7877
Fax: (65) 6438 4844
E-mail: hfrancisco@idrc.org.sg
Web site: www.eepsea.org

The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Laos, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Viet Nam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

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Environmental Taxes and Rural-Urban Migration – a Study from China

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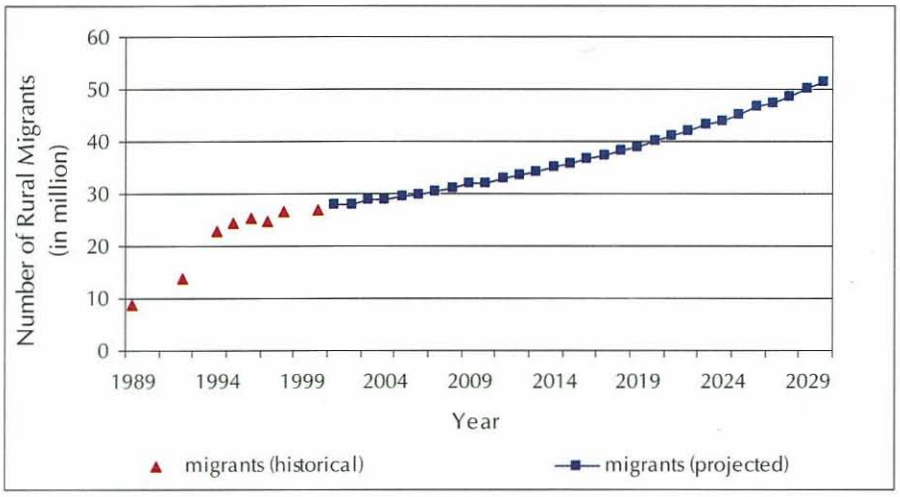
Many economists have proposed environmental taxes as a way of solving environmental challenges such as local pollution control and global warming. This makes it vital to understand how such taxes will affect people's welfare and how they will impact on the wider economy. This is particularly true for developing countries, which often have unique political, social and →

A summary of EEPSEA research report 2006-RR9, A Dynamic Computable General Equilibrium Analysis Of Environmental Taxation And "Rural-Urban" Migration Distortions In China by Jing Cao, Harvard China Project, Harvard University Center for the Environment, Cambridge, MA 02138, USA and School of Economics and Management, Tsinghua University, Beijing 100084, China. Email: Jing_Cao@ksg.harvard.edu and caojing@sem.tsinghua.edu.cn

"The proposed taxes would exacerbate

economic circumstances that are not adequately taken into account in most environmental research. A new study from China has gone some way to redress the imbalance and has assessed the impact of two types of environmental taxes within the context of the country's economy. It pays particular attention to the impact on a key factor shaping China's current economic renaissance: the migration of workers from China's countryside to its cities.



Forecast on future rural migrants

Jing Cao conducted the study as part of her PhD thesis at Harvard University. It analyzes the impact of a fuel tax and an output tax and finds that both would discourage the flow of migrants from China's countryside to its cities. Since China has a surplus of rural workers, the two environmental taxes would exacerbate a distortion in the country's labor market. By comparing the impact of the two tax policy regimes, Cao finds that the fuel tax is more efficient in terms of reducing pollution emissions and their associated environmental and health impacts; she also finds that it produces less distortion in the rural-urban migration process than the output tax. She therefore recommends that this would be the preferable policy to adopt.

A Rapid "Rural-Urban" Migration and Pollution Crisis

The research was carried out against a background of rapid industrial growth in China's urban areas and increasing productivity in its agriculture. This has produced profound social repercussions. In rural areas, the old "hukou" system, that has controlled the departure of rural people from the countryside, is gradually breaking down. Drawn by the promise of work and prosperity, more and more peasants are heading into the country's cities. Rural-urban migration almost tripled in the decade between late 1980's and the late 1990's.

At the same time, rapid economic growth has had a significant effect on China's environment. Pollution has dramatically increased: According to the World Bank, 16 out of the world's 20 most polluted cities are located in China. The atmosphere in the country is so polluted that it causes 400,000 premature deaths every year. China's carbon emissions are expected to surpass the US's before 2010. To address these challenges, the Chinese government is planning to implement policies that will provide economic incentives for pollution clean up, such as an environmental tax policy.

Taxes and Migration

Environmental taxes are, in theory, an effective mechanism to encourage industry to clean up its act. However, there is an on-going debate among environmental economists and others on the effect of environmental taxation on people's welfare and on the wider economy. It is argued that they can have a positive effect, if environmental tax revenue is used to replace taxes that are more regressive or more economically distorting. However since environmental taxes can raise the price of the polluting goods and discourage labour supply, they can also have a negative impact on people's overall welfare.

To contribute to this debate, and to find out how green taxes will impact specifically on the Chinese economy and on its people, Cao examined how environmental tax

current distortions in the country's labour market."

policies would affect "rural-urban" migration in China. This is a key piece of research because most of the economic development and urbanization literature suggests that if rural-urban migration goes smoothly, it will bring significant gains in welfare as people move from under-employment to higher-paid and more productive jobs. If green taxes disrupt or impede this migration, then this should be acknowledged and addressed in any future plans.

The Two Taxes

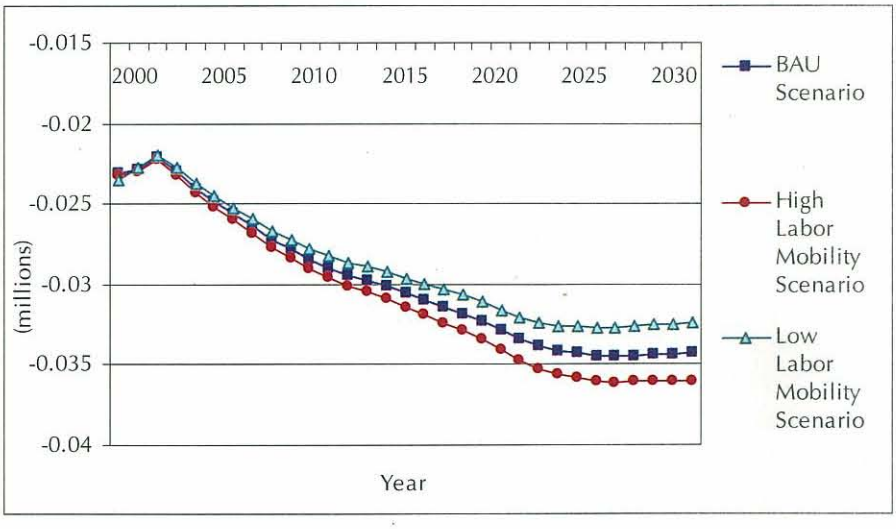
Cao reports on the impact of two potential environmental tax policies. The first is a tax on primary fuels. Under this policy, the tax rate would be proportional to the average health damage caused by each unit of fuel that is used. The aim of such a tax is to cause producers to use less fuel or shift to cleaner fuels. In Cao's fuel simulation, the overall tax was relatively small, only about 1.5-1.7%. The other policy is a tax on industrial output, where the tax rate is proportional to the marginal health damages produced by the pollution caused by each sector. The aim of this tax is to discourage polluting industry, as consumers will have to pay higher prices for products and services from dirty industrial sectors than from clean ones.

To examine the impact of these proposed tax policies, a model of the Chinese economy was developed. Simulations were then run to assess the impact of the two proposals over a 30-year period. To develop her model of the Chinese economy, Cao first looked at the factors affecting rural-urban migration behaviour, in particular how it is related to the difference between wages in the countryside and in the city. Using data from the 1995 Chinese Household Income Project, she confirmed the general consensus that if the urban-rural income differential increases, peasants are more likely to move and become migrant workers.

Cao's research model was built on this finding and incorporated the functioning of over 30 different industries and production factors such as capital, labour and energy. She also modelled two representative households, one in the city, one in the countryside to see what impact policy changes would have on householders' livelihoods. Cao also modelled how policy changes would affect the production of three main kinds of pollution emissions: particulate matters (PM10), sulphur dioxide (SO_2) and nitrogen oxides (NO_x). Data for the modelling exercise came from sources such as the Chinese input-output table, China Environmental Yearbook, the China Statistical Yearbook and the China Energy Yearbook. 2000 was set as the benchmark year for the simulation.

The Impact of the Taxes

Both the fuel tax and the output tax will decrease the wage gap between urban and rural workers and so discourage rural-urban migration flow. For example, the fuel tax will reduce the average migrant peasants' wage rate by 0.20% in the first year. However, the impact of fuel tax seems to be smaller than that of output tax on the migration process. This is



Absolute changes in rural-urban migrants of fuel tax simulation under three scenarios (Business As Usual (BAU), high labor mobility, low labor mobility)

partly explained by the fact that when an output tax is implemented, the tax impacts are broader than when the fuel tax is applied. This means that it has a larger negative impact on many sectors that use a lot of migrant labour, such as transportation, construction, and some service sectors.

The fuel tax has a significant positive impact on public health, due to the impact it has on pollution. For example, it produces large reductions in sulphur dioxide pollution and particulate matter emissions. This in turn will generate a large reduction (of between 19.6% and 21.4%) in premature deaths, and a reduction in the value of health damages of between 10.3% and 13.9%. In comparison, a tax on output would be less efficient at reducing emissions of either CO2, PM10 or SO2; it would therefore have less of an effect on public health. This is because an output policy provides no incentives for firms to switch fuels or to install scrubbers or other pollution reduction technology. The only positive aspect of the output tax (in comparison to the fuel tax) is that it would be easier to implement, since it was found to produce smaller changes in prices and incomes, and because its impacts would be spread across a broader range of sectors.

Which Tax to Choose?

As stated before, most of the economic development and urbanization literature suggests that China's urbanization process will bring a range of economic benefits. With this in mind, it is suggested by Cao's study that environmental taxes may distort the country's labour market by reducing the flow of rural migrants into the cities. This in turn would reduce the overall benefits of the migration. It is clear that this finding must be considered in any assessment of the economic costs and benefits of environmental tax reform in China.

Comparing the impacts of the fuel tax and the output tax, it is clear that, if an environmental tax were to be implemented, the fuel tax would be preferable. This policy would not only significantly reduce pollution emissions and decrease health damages, but will also put less of a brake on rural-urban migration.

Overall, Cao's analysis illustrates how the impact of environmental policies on the country's economy can be modelled. However, before these findings are used, several things should be kept in mind: The model used was a stylized simplification of Chinese economy that did not model off-farm activities in rural areas due to data limitations. Thus the results need to be interpreted with caution regarding the magnitude of the predicted effects. That said, they can be confidently used to highlight the direction of the impact of future environmental tax policies.

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